

**SUBJECT: MAINTENANCE MANAGEMENT PROGRAM FOR DOE NUCLEAR
FACILITIES**

1. **OBJECTIVE.** To define the program for the management of cost-effective maintenance of Department of Energy (DOE) nuclear facilities.
2. **CANCELLATION.** DOE O 433.1, *Maintenance Management Program for DOE Nuclear Facilities*, dated 6-1-01. Cancellation of an Order does not by itself modify or otherwise affect any contractual obligation to comply with the Order. Contractor Requirements Documents (CRDs) containing directive requirements that have been applied to a contract remain in effect until the contract is modified to eliminate or replace requirements from canceled directives.

3. **APPLICABILITY.**

- a. **DOE Elements.** Except for the exclusions in paragraph 3c, this Order applies to all DOE elements involved in the maintenance of DOE nuclear facilities and automatically applies to DOE elements created after it is issued. See Attachment 1.

The National Nuclear Security Administration (NNSA) Administrator will assure that NNSA employees and contractors comply with their respective responsibilities under this directive.

- b. **DOE Contractors.** The Contractor Requirements Document (CRD), Attachment 2, sets forth requirements to be applied to all contractors responsible for managing and maintaining DOE-owned or -leased nuclear facilities. Contractors must comply with the requirements listed in the CRD to the extent set forth in their contracts.

- c. **Exclusions.**

- (1) Naval Nuclear Propulsion Program maintenance covered under Executive Order 12344, in force under Section 3216(c) of Public Law (P.L.) 106-65 (50 U.S.C. 2406), is excluded from the provisions of this Order.
- (2) Radiological facilities, as defined by DOE Standard 1027-92, are excluded from the provisions of this Order.
- (3) Maintenance of radiation detection instrumentation at radiological facilities is governed by the requirements of Title 10, Code of Federal Regulations (CFR) 835, Subpart K, Articles 835.1001, 835.1003, and 835.401(b)1-4.

- (4) This Order does not apply to those portions of nuclear facility maintenance programs that are subject to regulation by other Federal agencies such as the U.S. Nuclear Regulatory Commission.
- (5) Deviations from the maintenance management program elements of this Order that are considered necessary and appropriate and any maintenance management elements that are not applicable will be identified and formally documented with supporting justification within the maintenance implementation plan (MIP).

4. REQUIREMENTS.

- a. To ensure that nuclear facility maintenance meets expectations, DOE elements may impose additional requirements and/or specific standards as necessary to preserve DOE property. A single maintenance program may be used to satisfy the regulated work; the requirements of DOE O 430.1B, *Real Property Asset Management*; any additional requirements imposed by DOE elements; and the requirements of this Order.
- b. Guidance for compliance with this Order is available in DOE G 433.1-1, *Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1*, which references Federal regulations, DOE directives, and industry best practices using a graded approach to clarify requirements and guidance for maintaining DOE-owned Government property.
- c. In addition to maintenance program requirements of DOE O 430.1B, *Real Property Asset Management*, dated 9-24-03, a nuclear facility maintenance management program must include a DOE-approved MIP that addresses the following elements using a graded approach:
 - (1) structures, systems, and components (SSCs) included in the program;
 - (2) periodic inspection of SSCs and equipment required to determine whether degradation or technical obsolescence threatens performance and/or safety;
 - (3) management systems used to control maintenance activities associated with the defined SSCs (work control, postmaintenance testing, material procurement and handling, and control and calibration of test equipment);
 - (4) assignment of roles and responsibilities and appropriate maintenance-related training and qualification requirements;
 - (5) interfaces between the maintenance organization and other organizations (e.g., operations, engineering, quality, training, and industrial health);

- (6) configuration management process established to ensure the integrity of the identified SSCs;
 - (7) prioritization process used to properly emphasize safety requirements, maintenance backlog, system availability, and requirements for those infrastructure elements identified as part of the nuclear facility safety basis;
 - (8) process for feedback and improvement established to provide relevant information regarding operations, maintenance, and assessment efforts;
 - (9) systems engineer programs established for the management of safety class, safety significant, and other active systems that perform important Functions as designated by facility line management and consistent with DOE O 420.1B and a designated system engineer with—
 - (a) the requisite knowledge of the system safety design basis and operating limits from the safety analysis and
 - (b) the lead responsibility for the configuration management of design; and
 - (10) An accurate maintenance history that compiles maintenance, resource, and cost data in a system which is retrievable and allows entering required and actual maintenance costs and availability data, and failure rates for mission-critical and safety SSCs into the DOE Facility Information Management System (See DOE O 430.1B and Section 4.15 of DOE G 433.1-1, *Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1*, dated 9-5-01.).
- d. The program must establish metrics to measure program performance and identify appropriate voluntary consensus standards that are incorporated into the program.
- e. The program must be integrated with—
 - (1) the Integrated Safety Management System (ISMS) established by DOE P 450.4, *Safety Management System Policy*, dated 10-15-96, and 48 CFR 970.5204-2;
 - (2) real property asset management programs defined in DOE O 430.1B;
 - (3) required nuclear safety basis established under 10 CFR Part 830, Subpart B;
 - (4) radiation protection requirements mandated under 10 CFR 835; and
 - (5) a quality assurance program established in 10 CFR 830, Subpart A.

- f. The MIP should be reviewed every two years and necessary changes submitted to DOE for approval.
5. RESPONSIBILITIES. The responsibilities of all DOE elements delineated in Section 9 of DOE M 411.1-1C, *Safety Management Functions, Responsibilities, and Authorities Manual*, dated 12-31-03, include ensuring that—
- a. sufficient resources are budgeted in a timely manner to provide DOE with the highest confidence in the reliable performance of mission-critical safety SSCs through proactive maintenance practices;
 - b. a cost-effective and efficient maintenance program is developed and implemented for all DOE nuclear facilities consistent with DOE's mission, safety and health, reliability, quality, and environmental protection objectives;
 - c. maintenance responsibility, authority, and accountability are clearly defined, appropriately assigned, and executed;
 - d. DOE operational awareness review and analysis capability exists for evaluation of maintenance program performance and effectiveness;
 - e. where maintenance requirements or accepted maintenance standards cannot be met, such instances are appropriately documented and acknowledged by DOE field elements including the granting of exemptions by DOE as appropriate and when requested; and
 - f. the requirements and standards for maintenance of nuclear facilities are incorporated into contracts and subcontracts, including support services contracts as appropriate.
6. REFERENCES.
- a. DOE O 226.1, *Implementation of Department of Energy Oversight Policy*, dated 9-15-05.
 - b. DOE O 414.1C, *Quality Assurance*, dated 6-17-05.
 - c. DOE O 420.1B, *Facility Safety*, dated 12-22-05.
 - d. DOE G 424.1-1, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*, dated 10-24-01.
 - e. DOE O 430.1B, *Real Property Asset Management*, dated 9-24-03.
 - f. DOE G 433.1-1, *Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1*, dated 9-5-01.

- g. DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, dated 3-27-98.
- h. DOE P 450.4, *Safety Management System Policy*, dated 10-15-96.
- i. DOE G 450.4-1B, *Integrated Safety Management System Guide for Use with Safety Management System Policies (DOE P 450.4 and DOE P 450.6); the Functions, Responsibilities, and Authorities Manual; and the Department of Energy Acquisition Regulation*, Volumes I and II, dated 3-1-01.
- j. DOE 5400.5, *Radiation Protection of the Public and the Environment*, dated 1-7-93.
- k. DOE 5480.19, *Conduct of Operations Requirements for DOE Facilities*, dated 7-9-90 (Chg 2, 10-23-01).
- l. 10 CFR 830, Nuclear Safety Management; Subpart A, Quality Assurance Requirements.
- m. 10 CFR 830, Nuclear Safety Management; Subpart B, Safety Basis Requirements.
- n. 10 CFR 830.122, Quality Assurance Criteria.
- o. 10 CFR 835, Occupational Radiation Protection.
- p. 10 CFR 851, Worker Safety and Health
- q. 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals.
- r. 41 CFR 101, Federal Property Management Regulations.
- s. 41 CFR 101.3, Annual Real Property Inventories.
- t. 41 CFR 102, Federal Management Regulation.
- u. 41 CFR Subtitle C, Chapter 109, Department of Energy Property Management Regulations.
- v. 48 CFR 45.509, Federal Acquisition Regulation, Care, Maintenance, and Use.
- w. 48 CFR 945.102-71, Maintenance of Records.
- x. 48 CFR 970.5204-2, Integration of Environment, Safety and Health into Work Planning and Execution.
- y. 48 CFR 970.5204-78, Laws, Regulations, and DOE Directives.
- z. DOE Personal Property Letter 970-3, High-Risk Personal Property.

- aa. Executive Order 12344, Naval Nuclear Propulsion Program.
 - bb. P.L. 106-65, National Defense Authorization Act for Fiscal year 2000;
Section 3216(c), Deputy Administrator for Naval Reactors (50 U.S.C. 2406).
7. CONTACT. Questions concerning this Order should be addressed to 301-903-5999;
facsimile, 301-903-6172.

BY ORDER OF THE SECRETARY OF ENERGY:

CLAY SELL
Deputy Secretary

DOE ELEMENTS TO WHICH DOE O 433.1X IS APPLICABLE

Office of the Secretary
Departmental Representative to the Defense Nuclear Facilities Safety Board
Energy Information Administration
National Nuclear Security Administration
Office of the Chief Financial Officer
Office of the Chief Information Officer
Office of Civilian Radioactive Waste Management
Office of Congressional and Intergovernmental Affairs
Office of Counterintelligence
Office of Economic Impact and Diversity
Office of Electricity Delivery and Energy Reliability
Office of Energy Efficiency and Renewable Energy
Office of Environment, Safety and Health
Office of Environmental Management
Office of Fossil Energy
Office of General Counsel
Office of Hearings and Appeals
Office of Human Capital Management
Office of Inspector General
Office of Intelligence
Office of Legacy Management
Office of Management
Office of Nuclear Energy, Science and Technology
Office of Policy and International Affairs
Office of Public Affairs
Office of Science
Office of Security and Safety Performance Assurance
Secretary of Energy Advisory Board
Bonneville Power Administration
Southeastern Power Administration
Southwestern Power Administration
Western Area Power Administration

CONTRACTOR REQUIREMENTS DOCUMENT
DOE O 433.1X, *Maintenance Management Program for*
DOE Nuclear Facilities

Regardless of the performer of the work, the contractor is responsible for complying with the requirements of this Contractor Requirements Document (CRD) and flowing down CRD requirements to subcontractors at any tier to the extent necessary to ensure contractor compliance.

Contractors at hazard category 1, 2, and 3 nuclear facilities must comply with the requirements listed in this CRD to the extent set forth in their contracts.

The requirements contained in this CRD include those in

- 48 CFR 45.509, Care, Maintenance, and Use, and
 - DOE O 430.1B, *Real Property Asset Management*, dated 9-24-03.
1. CONTRACTOR MAINTENANCE MANAGEMENT PROGRAMS should be developed in an integrated manner. Other regulations and Orders independent of this CRD that apply to nuclear facility maintenance programs include the following.
- a. The CRDs attached to—
 - (1) DOE O 226.1, *Implementation of Department of Energy Oversight Policy*, dated 9-15-05.
 - (2) DOE O 414.1C, *Quality Assurance*, dated 6-17-05.
 - (3) DOE O 420.1B, *Facility Safety*, dated 12-22-05.
 - (4) DOE O 430.1B, *Real Property Asset Management*, dated 9-24-03.
 - (5) DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, dated 3-27-98.
 - (6) DOE 5480.19, *Conduct of Operations Requirements for DOE Facilities*, dated 7-9-90 (Chg 2, 10-23-01).
 - b. DOE Guides
 - (1) DOE G 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*, dated 10-24-01.
 - (2) DOE G 433.1-1, *Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1*, dated 9-5-01.

- (3) DOE G 450.4-1B, *Integrated Safety Management System Guide for Use with Safety Management System Policies (DOE P 450.4 and DOE P 450.6); the Functions, Responsibilities, and Authorities Manual; and the Department of Energy Acquisition Regulation*, Volumes I and II, dated 3-1-01.
- c. DOE 5400.5, *Radiation Protection of the Public and the Environment*, dated 1-7-93.
- d. DOE P 450.4, *Safety Management System Policy*, dated 10-15-96.
- e. DOE Personal Property Letter 970.3, High-Risk Personal Property.
- f. DOE-HDBK-1003-96, *Guide to Good Practices for Training and Qualification of Maintenance Personnel*.
- g. DOE-HDBK-1206-98, *Guide to Good Practices for on-the-Job Training*.
- h. DOE-STD-1029-92, *Writer's Guide for Technical Procedures*.
- i. DOE-STD-1039-93, *Guide to Good Practices for Control of Equipment and System Status*.
- j. DOE-STD-1073-2003, *Configuration Management Program*.
- k. 10 CFR 830, Nuclear Safety Management; Subpart A, Quality Assurance Requirements.
- l. 10 CFR 830, Nuclear Safety Management; Subpart B, Safety Basis Requirements.
- m. 10 CFR 830.121, Quality Assurance Program.
- n. 10 CFR 830.122, Quality Assurance Criteria.
- o. 10 CFR 830.204, Documented Safety Analysis.
- p. 10 CFR 835, Occupational Radiation Protection.
- q. 10 CFR 851, Worker Safety and Health.
- r. 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals.
- s. 41 CFR 101, Federal Property Management Regulations.
- t. 41 CFR 101.3, Annual Real Property Inventories.

- u. 41 CFR 102, Federal Management Regulations.
- v. 41 CFR Subtitle C, Chapter 109, Department of Energy Property Management Regulations.
- w. 48 CFR 45.509, Federal Acquisition Regulation, Care, Maintenance, and Use.
- x. 48 CFR 945.102-71, Maintenance of Records.
- y. 48 CFR 970.5204-2, Integration of Environment, Safety and Health into Work Planning and Execution.
- z. 48 CFR 970.5204-78, Laws, Regulations, and DOE Directives.

2. REQUIREMENTS.

- a. Contractors must develop and submit for DOE approval maintenance implementation plans (MIPs) that clearly define the following:
 - (1) structures, systems, and components (SSCs) included in the program (typically safety SSCs identified in the nuclear facility safety basis, critical to mission objectives or facility operations, or desirable for inclusion in the maintenance program for other reasons) [10 CFR 830.204(b)(5)];
 - (2) periodic inspection of SSCs and equipment to determine whether degradation or technical obsolescence threatens performance or safety;
 - (3) management systems that control maintenance of defined SSCs (work control, postmaintenance testing, material procurement and handling, and control and calibration of test equipment);
 - (4) assignment of roles and responsibilities;
 - (5) interfaces between the maintenance and other organizations (e.g., operations, engineering, and training);
 - (6) integration with
 - (a) the ISMS established by DOE P 450.4 and 48 CFR 970.5204-2;
 - (b) real property asset management programs under DOE O 430.1B [See 10 CFR 830.121(c)(2) and 10 CFR 830.122(a); DOE G 450.4-1B; ISMS Principles 1 and 2 and ISMS Function 1];

- (c) required nuclear safety bases established under 10 CFR Part 830, Subpart B; and
 - (d) quality assurance programs established in 10 CFR Part 830, Subpart A.
 - (7) a configuration management processes to ensure the integrity of the identified nuclear facility safety SSCs using a graded approach [DOE-STD-1073-93; 10 CFR 830.122(d) and (e)];
 - (8) a prioritization process that places proper emphasis on safety requirements, the maintenance backlog, system availability, and requirements for those infrastructure elements identified as part of the nuclear facility safety basis;
 - (9) a process for feedback and improvement based on relevant information from the results of operations, maintenance, and assessment efforts [10 CFR 830.122(c), (i), and (j); and DOE G 450.4-1B, ISMS Function 5];
 - (10) how system engineers assigned to safety systems are involved in the planning and execution of maintenance activities affecting their assigned systems with—
 - (a) the requisite knowledge of the system safety design basis and operating limits from the safety analysis and
 - (b) the lead responsibility for the configuration management of the design;
 - (11) accurate maintenance history that compiles structures, systems, and components data and other maintenance, resource, and cost data in a that is retrievable and allows entering required maintenance costs, actual maintenance costs, and availability data and failure rates for mission-critical and safety SSCs into the DOE Facility Information Management System (see DOE O 430.1B and DOE G 433.1-1, Section 4.15).
- b. Contractor programs should establish metrics to measure performance and incorporate appropriate voluntary consensus standards.
- c. Contractor programs should address the following elements as appropriate.
- (1) Maintenance Organization and Administration that must ensure a high level of performance through effective implementation and control of activities. [See DOE G 433.1-1, Section 4.1; 10 CFR 830.122(a) and

10 CFR 830.121(c)(4); and DOE G 450.4-1B, ISMS Principles 1, 2 and 7.]

- (2) Training and Qualification of Maintenance Personnel that must be implemented to develop and maintain the knowledge and skills needed by personnel to perform maintenance activities effectively. [See DOE 5480.20A; DOE O 414.1A; DOE G 433.1-1, Section 4.2; DOE-HDBK-1206-98; DOE-HDBK-1003-96; 10 CFR 830.122(b); and DOE G 450.4-1B, ISMS Principle 3.]
- (3) Maintenance Facilities, Equipment, and Tools that efficiently support nuclear facility maintenance and training. [See DOE G 433.1-1, Section 4.3.]
- (4) Types of Maintenance that balances corrective and preventive maintenance properly to provide a high degree of confidence that nuclear facility equipment degradation is identified and corrected, that equipment life is optimized, and that the maintenance program is cost effective. [See 48 CFR 45.509; DOE G 433.1-1, Section 4.4; 10 CFR 830.122(c) and (e); and DOE G 450.4-1B, ISMS Principle 4 and ISMS Function 1.]
- (5) Maintenance Procedures and other work-related documents (e.g., drawings and instructions) must be prepared and used to provide appropriate work direction and to ensure that maintenance is performed safely and efficiently. [See DOE G 433.1-1, Section 4.5; DOE-STD-1029-92; 10 CFR 830.122(d) and (e); and DOE G 450.4-1B, ISMS Principles 5 and 6 and ISMS Functions 4 and 5.]
- (6) A Planning, Scheduling, and Coordination of Maintenance system implemented to—
 - (a) ensure that maintenance and surveillances associated with technical safety requirements (TSRs), is accomplished in a timely manner;
 - (b) improve efficiency;
 - (c) reduce chemical and physical hazard radiation exposure to the as-low-as-reasonably-achievable (ALARA) standard;
 - (d) increase equipment availability;
 - (e) ensure worker safety through training and proper use of personal protective equipment; and

- (f) ensure that hazardous waste is properly segregated, treated, or disposed. [See DOE G 433.1-1, Section 4.6; 10 CFR 830.122(a); and DOE G 450.4-1B, ISMS Principles 1 and 4 and ISMS Function 1.]
- (7) Control of Maintenance Activities that includes management involvement to ensure safe and reliable nuclear facility operations that are integrated with the work authorization and control requirements for conduct of operations at DOE facilities. [See DOE 5480.19; DOE-STD-1039-93; DOE G 433.1-1, Section 4.7; 10 CFR 830.122(a) and (e); DOE G 450.4-1B, ISMS Principles 1, 2, and 7 and ISMS Function 4.]
- (8) Post-maintenance Testing performed to verify that components fulfill their design Functions when returned to service after maintenance. [See DOE-STD-1039-93; DOE G 433.1-1, Section 4.8; and 10 CFR 830.122(h).]
- (9) Procurement of Parts, Materials, and Services required for maintenance activities available when needed. [See DOE G 433.1-1, Section 4.9; DOE G 440.1-6; and 10 CFR 830.122(g).]
- (10) Receipt, Inspection, Handling, Storage, Retrieval, Issuance, and Disposal Turn-in of Personal Property used for maintenance covered by effective implementation of policies and procedures; suspect and counterfeit item control requirements; and as appropriate, high-risk personal property management and control requirements from the time an item is received for installation in or maintenance of the nuclear facility until it is turned in for disposal. [See DOE O 414.1A; DOE O 440.1A; DOE G 433.1-1, Section 4.10; DOE G 440.1-6; DOE Personal Property Letter 970-3; and 10 CFR 830.122(g).]
- (11) Control and Calibration of Measuring and Test Equipment consistent with quality assurance requirements to ensure the accurate performance of nuclear facility instrumentation and equipment. [See DOE O 414.1A; DOE G 433.1-1, Section 4.11; and 10 CFR 830.122(e) and (h).]
- (12) Maintenance Tools and Equipment Control methods established to provide for storage, issuance, and maintenance of an adequate and readily available supply of tools and equipment and for the development of special tools and equipment as needed. [See DOE G 433.1-1, Section 4.12 and 10 CFR 830.122(e).]
- (13) Facility Condition Inspection conducted by management periodically direct independent assessments of equipment and facilities to ensure safe nuclear facility condition and housekeeping and to meet fire protection and natural hazard phenomena mitigation requirements of DOE O 420.1B,

Facility Safety. [See DOE O 420.1A; DOE G 433.1-1, Section 4.13; and 10 CFR 830.122(h) and (j).]

- (14) Management Involvement of corporate and nuclear facility officials sufficiently to be technically informed and personally familiar with facility conditions. [See DOE G 433.1-1, Section 4.14 and 10 CFR 830.122(a) and (i).]
- (15) Maintenance History and trending program to document historical information for maintenance planning and support maintenance and performance trending of nuclear facility systems and components with all records and documentation maintained according to the approved site-specific records retention and disposition schedule. [See DOE G 433.1-1, Section 4.15; DOE O 200.1; and 10 CFR 830.122(d).]
- (16) Analysis of Maintenance Problems to determine and correct root causes of unplanned occurrences related to maintenance. [See DOE-NE-STD-1004-92; DOE G 433.1-1, Section 4.16; and 10 CFR 830.122(c).]
- (17) Modification Work at nuclear facilities, accomplished under the same basic administrative controls as those applied to nuclear facility maintenance so that risk to the facility, equipment, environment, or personnel does not increase because of modifications. [See DOE-STD-1039-93; DOE G 433.1-1, Section 4.17; DOE-STD-1073-93; 10 CFR 830, Subparts A and B; and DOE G 450.4-1B, ISMS Principle 7 and ISMS Function 4.] Controls should be integrated with—
 - (a) safety basis, nuclear safety, fire protection, and natural hazard phenomena mitigation [See DOE O 420.1B];
 - (b) pressure safety and suspect and counterfeit item control [See DOE O 440.1A]; and
 - (c) control of equipment and system status [See DOE 5480.19].
- (18) Seasonal Facility Preservation. A program should be in place to prevent equipment and building damage resulting from weather conditions. [See DOE G 433.1-1, Section 4.18; 10 CFR 830.120(c)(2)(i); and 10 CFR 830.122(e).]

3. DEVIATIONS OR NONAPPLICABILITY.

Deviations from maintenance management program elements of this CRD that are considered necessary and appropriate or any maintenance management elements that are not applicable should be identified and formally documented with supporting justification within the MIP.

4. EXEMPTIONS: Exemptions to this CRD will be obtained using a graded approach and the exemption process prescribed in Subpart E of 10 CFR 820.
5. REVIEW AND UPDATE. The contractor will review and update the MIP every 2 years and submit any changes to DOE for approval.